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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/883,216	06/19/2001	Jen Kuang Fang	4459-050	9853

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EXAMINER

PAREKH, NITIN

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 10/07/2002

6

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/883,216

Applicant(s)

FANG ET AL.

Examiner

Nitin Parekh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) 5 and 6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang (US Pat. 6452270) in view of Li et al (US Pat. 6312830), Hosomi et al (US Pat. 5631499) and Crafts et al (US Pat. 5492235).

Regarding claim 1, Huang discloses a conventional/prior art forming a semiconductor device having a bump electrode, the method comprising :

- providing an aluminum contact pad (110 in Fig. 1- Prior art) on a substrate, a portion of the pad being exposed through a dielectric layer (130 in Fig. 1- Prior art) on the substrate
- forming an aluminum/adhesion layer (140a in Fig. 1- Prior art) on the dielectric layer having the portion of the aluminum pad being exposed through the dielectric layer

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- forming a nickel-vanadium layer/barrier layer (140b in Fig. 1- Prior art) on the titanium layer
- forming a copper layer/wetting/adhesion layer (140c in Fig. 1- Prior art) on the nickel-vanadium layer
- selectively forming a gold bump on the nickel layer at a location corresponding to the aluminum pad, and
- etching the aluminum, nickel-vanadium and copper layers

(Fig. 1; Col. 1, line 45- Col. 2, line 20).

Huang et al fail to specify forming:

- a) a titanium layer on the nickel-vanadium layer, and
- b) performing etching using gold bump as a mask

a) Li et al teach forming an under bump metallurgy (UBM) structure comprising a variety of configurations including a multiplayer/three layers A, B and C, A being adjacent to the pad, where the third layer (layer C) comprises titanium or vanadium which if formed on underlying layers (A/B) to improve the wetting/adhesion, physical/chemical stability and reliability for the UBM structure (Col. 3, line 15-30).

b) Hosomi et al teach forming an UBM structure by conventional etching of the layers such as nickel, titanium, etc. using gold bump as a mask (Fig. 10; Col. 2).

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Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate titanium layer on the nickel-vanadium layer and perform etching using gold bump as a mask so that the wetting/adhesion and reliability of the UBM structure can be improved using Li et al and Hosomi et al's processes in Huang's method.

Regarding claim 2, Huang fails to specify the performing the cleaning step by treating titanium layer with a cleaning medium such as HCl.

It is conventional in the chip fabrication and interconnect technology art to use the process steps of cleaning and surface treatment of the metal surface/oxide layer using a variety of acids, peroxides, etc.

Crafts et al teach using conventional cleaning/etching of the UBM layers such as titanium using a cleaning medium/solution comprising hydrochloric acid/HCl (Col. 5, line 45-50).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate a step of cleaning/treating titanium layer with a cleaning medium such as HCl so that the wetting/adhesion and reliability of the UBM structure can be improved using Crafts et al, Li et al and Hosomi et al's processes in Huang's method.

Regarding claims 3 and 4, the claim elements have been addressed in the rejection as explained above for claim 2.

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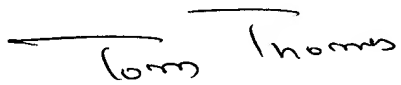
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 703-305-3410. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-3431.

Nitin Parekh

NP  
09-30-02

  
TOM THOMAS  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800